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# Forest Health Management Report

## Forest Insect and Disease Conditions in Alaska - 1991

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# FOREST PEST CONDITIONS IN ALASKA - 1991

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# FOREST PEST CONDITIONS IN ALASKA - 1991

## CONDITIONS IN BRIEF

Forest insect and disease populations and related damage increased throughout Alaskan forests in 1991. 1991 was the third consecutive year with warm, dry springs and early summers which allowed insect populations to explode, especially in South-Central and Interior Alaska. Spruce bark beetle activity increased for the third consecutive year, as on-going and new infestations as determined by 1991 aerial surveys now affect more than 375,000 acres. Increased bark beetle activity occurred in the Copper River area near Chitina; the Clam Gulch-Tustemena Lake area on the Kenai Peninsula, and portions of the west side of Cook Inlet near the Skwenta River. The Yukon River outbreak increased slightly in 1991. The outbreak adjacent to Russell Fiord, near Yakutat, has subsided. In Southeast Alaska, spruce beetle outbreaks continued within Glacier Bay National Park and near Haines. Hardwood defoliator activity increased for the second consecutive year throughout most of South-Central and Interior Alaska with willow defoliation accounting for the majority of the increase. Assorted leaf miners, Noctuid, and Rusty-tussock moth larvae were responsible for the defoliation of more than 130,000 acres of willow vs. 30,000 defoliated acres noted in 1990. Spruce budworm populations exploded near Fairbanks and Delta Junction in Interior Alaska where more than 20,000 acres of white spruce were defoliated. In Southeast Alaska, spruce budworm activity along the Ferebee and Kelsall Rivers was significantly less than that of 1990. Black-headed budworm defoliation in Prince William Sound decreased in 1991. 7,000 acres of western hemlock and Sitka spruce were defoliated this year vs. 40,000 acres in 1990. Light defoliation from black-headed budworm was noted on approximately 6000 acres of western hemlock on the Tongass National Forest. Hemlock sawfly defoliated approximately 900 acres of western hemlock on Dall Island in 1991.

The most significant diseases of Alaskan forests are those that persist on sites from year-to-year: yellow cedar decline, wood decay of live trees, and hemlock dwarf mistletoe. More than 526,000 acres of cedar decline occur in Southeast Alaska in a broad band from western Chichigof Island through the Ketchikan area (Table 1). Heartrot and buttrot fungi cause significant cull in all tree species in Alaska. Hemlock dwarf mistletoe continue to cause growth loss and mortality in old-growth forests of Southeast Alaska; its impact in young-growth stands appears to depend on the presence of large infected residuals left after harvesting of the previous stands. An outbreak of hemlock canker, caused by the fungus *Xenomeris abietis* and possibly aggravated by dust, killed small hemlocks and the lower branches of large hemlock trees along roads along more than 60 miles on Prince of Wales Island for the second consecutive year. Spruce needle rust was present at relatively high levels throughout Alaska, but most other foliar pathogens occurred at low to moderate levels in 1991. Aspen leaf blight was conspicuous for the second consecutive year on portions of the Kenai Peninsula. Porcupines continued to damage spruce and hemlock in valuable young-growth stands in southeast Alaska.

Table 1 summarizes insect and disease activity by land ownership.

Table 1. 1991 Forest insect and disease infestation in Alaska by land ownership and pest.[a]

| Pest | National Forest | Other Federal | Native | State & Private |
|---|---|---|---|---|
| | - - - - - - - - - - Acres - - - - - - - - - - - - | | | |
| Spruce beetle | 19,526 | 142,228 | 23,315 | 191,748 |
| Larch Beetle | ----- | 156 | ----- | 3,425 |
| Engravers | ---- | 2,572 | 1,414 | 1,902 |
| Spruce budworm | ---- | ---- | 1,791 | 25,143 |
| Black-headed budworm | 11,064 | ----- | 2,107 | 234 |
| Hemlock sawfly | 934 | ---- | ---- | ---- |
| Large aspen tortrix | ---- | 3,176 | 267 | 677 |
| Spear-marked black moth | ---- | 4,223 | ---- | ---- |
| Birch defoliation | ---- | 215 | 251 | 716 |
| Cottonwood defoliation | 2,955 | 4,617 | ---- | 9,119 |
| Willow defoliation | ---- | 53,538 | 75,081 | 3,098 |
| Alaska yellow-cedar[b] decline | 500,406 | ----- | 17,511 | 8,718 |
| **Totals** | 534,885 | 210,725 | 121,737 | 244,780 |
| **GRAND TOTAL** | | 1,112,127 acres | | |

[a]Table entries do not include many of the most destructive diseases (e.g., wood decays and dwarf mistletoe) because these losses are not detectable in aerial surveys.

[b]Acreage of Alaska yellow-cedar decline reported is the cumulative total up to 1990, and not an annual figure.

## STATUS OF INSECTS

### SPRUCE BEETLE
*Dendroctonus rufipennis* Kirby

Alaska spruce bark beetle populations increased dramatically for the second consecutive year in 1991 (see Figure 1). Newly detected infestations as well as active on-going infestations affected more than 375,000 acres of Alaska's spruce forests. This is an increase of more than 130,000 acres over levels infested in 1990. More than 90% of spruce bark beetle activity is occurring in the Lutz and white spruce stands of South-Central and Interior Alaska. Unusually warm spring and early summer weather conditions throughout South-Central and Interior Alaska for three consecutive years have helped increase bark beetle populations by decreasing spruce beetle developmental times from two to one year. Likewise, warm, dry spring and summer weather conditions may have increased spruce susceptibility to spruce beetle attack by decreasing host defense mechanisms; mainly resin exudation.

White, Lutz, and Sitka spruce mortality continues on 19,000 acres of the Chugach National Forest and is a slight decline (3,000 acres) over the acreage infested in 1990. This decline is the result of more than ten years of heavy spruce beetle activity on the Chugach National Forest which has depleted most of the available host material. Populations are expected to decline even further in 1992. The majority of the spruce beetle activity on the Chugach National Forest is located from Russian Lakes to and along the Sterling Highway between Broadview Guard Station and Gwin's Lodge (6,772 ac.). Spruce beetle activity dramatically increased on State and private lands near Moose Pass; 3,114 acres of spruce were infested along the north shore of Upper Trail Lake. Spruce beetle activity increased dramatically further south on the Kenai Peninsula on Kenai National Wildlife Refuge lands and adjoining State and private lands. Areas of the largest increase were detected from Pt. Possession south to Skilak Lake on Wildlife Refuge lands; approximately 75,000 acres of scattered spruce beetle activity were aerially detected. Further south on the Kenai Peninsula, the 35,000 acre outbreak detected in 1990 between Clam Gulch and Tustumena Lake increased to 55,346 acres. Light scattered spruce beetle activity was again apparent along the Fox River (2,024 acres) and 16 miles NNE of Anchor Point where more than 1,000 acres of infested spruce were detected. Spruce beetle populations in the Kachemak Bay area have declined in 1991. Approximately 7,000 acres of infested Sitka spruce were aerially detected this year versus 10,000 acres in 1990. The areas most heavily infested (6,695 ac.) are from Aurora Lagoon to Battle Creek. Expansions outside this area were not detected. Very little (less than 25 acres) of scattered spruce beetle activity was detected further south and west along Kachemak Bay towards Seldovia. Spruce beetle activity on the west side of Cook Inlet dramatically increased in 1991. Approximately 45,000 acres of infested spruce were aerially detected versus 12,721 acres in 1990. Areas of increased activity occurred 8 miles NW of Beluga where 17,437 acres of spruce have been infested. Likewise, 15,000 acres of

infested spruce were noted near the confluence of the Talachulitna and Skwenta Rivers; an increase of 2,000 acres over 1990 levels. Approximately 2,000 acres of scattered spruce beetle activity were noted within the Nancy Lake State Recreation Area north of Wasilla. An additional 1,090 acres of beetle activity were noted 14 miles south of Talkeetna. Spruce bark beetle activity appeared to have decreased in 1991 in the Anchorage Bowl as only 2,000 acres of scattered infested spruce were detected along the Hillside from the foot of Flat Top Mountain to McHugh Peak. Small, isolated beetle activity was detected in the following areas: 5 acres near the mouth of Campbell Creek; 10 acres near end of Klatt Road; 415 acres on Fire Island, and 150 acres in Ship Creek Valley. Further north, 156 acres of spruce beetle infestations were detected above Eagle River; 701 acres bordering Eklutna Lake; and 311 acres along the slopes of Bodenburg Butte near Palmer. Spruce bark beetle activity continues further west near Lake Clark and Lake Iliamna. 1,245 acres of infested spruce were detected 4 miles NW of Pile Bay Village. Another 2,335 acres of scattered spruce beetle infested trees were detected on the south-west side of Lake Clark Pass.

The Tiekel River outbreak maintained its 25,000 acres of activity along the Tiekel River north to Pump Station 12. Last year approximately 11,000 acres of spruce beetle activity were noted due south of the confluence of the Chitina and Copper Rivers. This activity greatly expanded in 1991 as more than 45,000 acres of spruce beetle activity were noted from Pump Station 12 northeast to McCarthy and northwest to Gulkana. The first spruce beetle outbreak (200,000) recorded in Alaska in 1922 was located near this area. It appears that after 70 years the live residual stand has become susceptible to spruce beetle activity. There is a large quantity of unattacked but susceptible host material in this area. This current spruce beetle activity has the potential of becoming one of Alaska's largest infestations. The areas of heaviest and most intensive spruce beetle activity include: 15,257 acres from Tonsina to Pump Station 12; 3,425 acres near Tebay Lakes; 3,581 acres near Nelson Mtn. 34 miles west SW of McCarthy, 6,900 acres 8 miles NE of Chitina, 3,036 acres 16 miles N of Chitina; and 5,683 acres 21 miles NNW of Chitina. An additional 1,323 acres of spruce beetle activity were noted 4 miles SE of Glennallen.

Spruce beetle activity along the Yukon River increased in 1991 after a significant decrease in 1990. More than 100,000 acres were infested in 1987, decreasing to 41,000 acres in 1989 then increasing to more than 80,000 acres in 1991. Some of this apparent increase may be the result of the more intensive 1991 aerial survey. Ground checks of infested areas have indicated that *Ips* beetles may be as important as spruce beetles as mortality agents. The areas containing heavy spruce beetle activity include; 34,499 acres along the Yukon River from Fox Point Island north to Quail Island; 31,373 acres from Big Eightmile Island to Galena, and 4,359 acres along the Nulato River approximately 18 miles west of Nulato. Scattered spruce beetle activity continues along the Kuskokwim River where approximately 7,800 acres are currently infested; 4,000 acres approximately 75 miles SW of Sleetmute and 3,736 acres of infested white spruce scattered along the Kuskokwim River from 37 to 66 miles

SSW of McGrath.

In Southeast Alaska, active spruce beetle infestations totalled almost 16,000 acres. Approximately 9200 acres of Sitka spruce are infested within Glacier Bay National Park. Approximately 27,000 acres have been affected since spruce beetle was first detected there in the late 1970's. Glacier Bay's spruce beetle activity is ongoing on the Beardsley Islands and on the mainland west of Gustavus, AK. Spruce beetle infestations along the Klehini and Kelsall Rivers near Haines, AK, total approximately 6500 acres. Favorable weather the past three years appears to favor the expansion of these infestations.

The spruce beetle outbreak near Russell Fiord (Yakutat Ranger District) has subsided. In addition, no new blowdown was observed in the area in 1991. Salvage of previous beetle-killed Sitka spruce is ongoing. During the winter of 1990-91, strong winds blew down large patches of timber in the vicinity of the Wright and Taku Rivers. Investigations during 1991 indicate potential spruce and *Ips* beetle buildup there.

In 1991 spruce beetle infestations throughout Alaska by ownership are as follows; National Forest land - 19,526 acres; State and Private - 191,748 acres, Native land - 23,315 acres and other Federal lands (e.g. Kenai National Wildlife Refuge, National Parks, etc.) - 142,228 acres.

## ENGRAVERS
***Ips perturbatus*** Eichh.

Engraver activity increased in 1991 with 5,800 acres of infested spruce aerially detected this year versus 326 acres detected last year. The majority of the infested areas occurred along the shores of the Noatak River near Noatak. However, as previously mentioned, it is quite possible that much of the Yukon River spruce beetle infestation is caused by engraver beetles. Substantial top breakage of white spruce occurred near Fairbanks as a result of a late, heavy snowfall. This material was available as breeding habitat for the 1991 emerging *Ips* populations. It is quite possible that increased mortality of standing spruce will occur next summer as a direct result of this *Ips* population increase.

In Southeast Alaska, windthrown Sitka spruce near the confluence of the Wright and Taku Rivers was attacked by *Ips* beetles. Beetles emerging in 1992 may attack adjacent standing spruce.

## EASTERN LARCH BEETLE
***Dendroctonus simplex*** (LeC.)

Eastern larch beetle, activity increased after more than three years of inactivity in Interior Alaska. More than 3,000 acres of scattered larch mortality were aerially detected. The majority of the activity was detected 16 miles ENE of Delta Junction. Larch beetle activity will continue to be scattered and low as most of the susceptible host material was killed in the large infestations of the early 1970's.

## SPRUCE BUDWORM
***Choristoneura*** sp.

In 1990 *C. fumiferana* populations increased in interior Alaska's white spruce stands. Budworm populations were high

enough to cause severe defoliation of 2-4 year old planted stock but not high enough for signs of defoliation to be aerially detected. Populations increased once again in 1991. Heavy budworm defoliation was detected on 7,551 acres of white spruce from Black Rapids to Donnelly south of Delta Junction and on 12,610 acres of white spruce in the Bonanza Creek and Gold Stream Valley areas near Fairbanks (see Figure 2). As previously mentioned, *Ips* populations are building in the Fairbanks area. Many of the budworm defoliated trees are now stressed and occur in areas of potentially high *Ips* populations, thus increasing the probability of an *Ips* outbreak next year. 623 acres of apparent budworm activity were detected along the Resurrection River 8 miles NW of Seward.

In Southeast Alaska, budworm activity declined significantly along the Kelsall and Ferebee Rivers west of Haines. However, approximately 5000 acres of Sitka spruce did receive moderate defoliation. Though budworm populations will likely decline, defoliation is expected there again in 1992.

## WESTERN BLACK-HEADED BUDWORM
***Acleris gloverana*** Walsingham

Black-headed budworm defoliation of western hemlock and Sitka spruce in Prince William Sound significantly declined in 1991. Aerial detection surveys noted 7,491 acres of infested hemlock and spruce vs. 40,000 acres in 1990 and 145,000 acres in 1988. Areas most seriously affected include: 4,126 acres along coast between Tatitlek and Cordova and on 623 acres along shore of Ester Island 22 miles ENE of Whittier. Most of the budworm activity has been limited to forested areas along the shoreline.

In Southeast Alaska, light budworm defoliation was noted on approximately 6000 acres of mature western hemlock. Defoliation was apparent on the west side of Shelter Island, on the mainland north of the Taku River, and on southwest Admiralty Island. South of Frederick Sound, defoliation occurred on Baker Island and on Prince of Wales Island near San Christoval Channel and along the South Arm of Moira Sound. The highest budworm larvae counts of 1991 were obtained near the North Arm of Hood Bay on southwest Admiralty Island and at Calder Bay on northwest Prince of Wales Island.

## HEMLOCK SAWFLY
***Neodiprion tsugae*** Middleton

Hemlock sawflies defoliated approximately 900 acres of mature western hemlock on Dall Island near Camp Cove. The highest sawfly larvae counts of the 1991 survey occurred at Calder Bay (northwest Prince of Wales Island) and at Thorne Island (northeast side of Prince of Wales Island). Sawfly populations will likely increase south of Frederick Sound in 1992.

## SPRUCE BUD MOTH
***Zeiraphera*** sp.

Populations of the spruce bud moth collapsed in Sitka spruce stands south of Yakutat. In 1990, approximately 8,600 acres were defoliated. No new defoliation was detected in 1991. Barring any unforeseen bud moth buildup in 1992, host recovery is expected.

## LARGE ASPEN TORTRIX
*Choristoneura conflictana* Wlkr.

Tortrix populations decreased in 1991. Only 4,120 acres of defoliated aspen were detected this year versus 63,234 acres in 1990. The majority of the 1991 defoliation (2,414 acres) occurred on the Kenai National Wildlife Refuge near Skilak Lake and Skilak River.

## SPEAR-MARKED BLACK MOTH
*Rheumaptera hastata* L.

Black moth populations increased slightly in Interior Alaska from 867 acres of defoliated birch in 1990 to 4,223 acres in 1991. Areas of concentrated defoliation occurred on 1,343 acres 12 miles south of Ruby along the Yukon River and on 1,500 acres near the confluence of the Kandik and Yukon Rivers. Further west along the Yukon River, 1,401 acres of defoliated birch were aerially detected 11 miles east of the Yukon River bridge. The 13,000 acres of defoliated birch in 1990 on the Kenai National Wildlife Refuge was not apparent during the 1991 aerial surveys.

## WILLOW DEFOLIATION

The amount of willow defoliation increased dramatically throughout South-Central and Interior Alaska in 1991 as a direct result of two consecutive unseasonably warm, dry springs and early summers. 1991 aerial surveys detected more than 130,000 acres of defoliated willow; four times the area defoliated in 1990. The most heavily defoliated areas occurred throughout the riparian zones along the Yukon, Kuskokwim, Mulchatna, and Nusagak Rivers as well as in the Lake Clark/Iliamna area and portions of the Seward Peninsula. Areas along the Seward Highway near Moose Pass on the Kenai Peninsula were also defoliated. Willow defoliation was also evident along the highway west of Haines. Although larval numbers were high and defoliation heavy in these areas, many impacted willow had refoliated by August. Hardwood shrubs are resilent species capable of withstanding several years of heavy defoliation with minimal impact. In some cases heavy defoliation may kill back the older shoots resulting in a spurt of new growth the following spring. There is no specific single causal agent involved in this defoliation but rather a varied group of defoliators. Willow along the Yukon river was primarily defoliated by leaf and blotch miners (Cosmopterygidae, Gelechiidae, and Gracilariidae). These are very small caterpillars which feed between the upper and lower leaf epidermis. Leaves which have been fed upon have a brownish-papery appearance. External defoliators such as noctuid and tortricid caterpillars were responsible for the majority of defoliation in the Anchorage Bowl and Lake Clark/Iliamna areas. Leaf beetles (*Chrysomela* sp.) were the most commonly encountered willow defoliator on the Kenai Peninsula.

Rusty tussock moth populations (*Orgyia antiqua* (L)) increased to epidemic proportions throughout areas of the Kuskokwim River drainage and portions of the Seward Peninsula. This tussock moth has a wide distribution including Europe, southern Canada, and the northern United States. In the west, it is distributed from California to Alaska and common hosts include alder, blueberry, willow, birch, and western hemlock and some spruces.

In Alaska, most rusty tussock moth populations are found on willow. There is probably only one generation per year in Alaska overwintering in the egg stage.

## COTTONWOOD DEFOLIATION
### *Chrysomela* sp. and *Lyonetia* sp.

Approximately 13,736 acres of defoliated cottonwood were detected in 1991. Sixty percent of this defoliation occurred in Interior Alaska, most near Holy Cross and Unalakleet, and was probably a result of river flooding and not insect damage. The remaining 5,448 acres of defoliated cottonwood occurred in Prince William Sound near Cape Yakataga and was brought about by the combined feeding of leaf miners and leaf beetles.

Leaf beetles defoliated approximately 1,500 acres of cottonwood and willow along the Dangerous River near Yakutat. Cottonwood defoliation by leaf beetles, totalling approximately 3,500 acres, was noted in Southeast Alaska along the Antler, Stikine, Taku and Unuk Rivers. Consecutive years of heavy defoliation may result in a limited growth reduction and some top kill.

## BIRCH DEFOLIATION

A few hundred acres of birch were heavily defoliated on Ft. Richardson Military land along the southside of the Glenn Highway near Ship Creek. Defoliation was heavy and apparent throughout July and August. The causal agents appear to be Noctuid caterpillars belonging to the genera, *Sunira* and *Parastichtis*. Final identification is pending. Damage appears to be more cosmetic than harmful. If 1992 spring weather conditions are once again unseasonably warm and dry, we can expect continued heavy defoliation. Leaf miners defoliated birch along the highway near Haines for the third consecutive year, but host damage seemed insignificant.

## STRIPED ALDER SAWFLY
### *Hemichroa crocea* (Fourcroy)

Riparian zone alder in various localities in the Mat-Su Valley was heavily defoliated by large populations of the striped alder sawfly. No defoliation acreage figures are available. One of the heaviest areas of defoliation occurred along the banks of the Little Susitna River from Houston to the Burma Landing.

Previous alder sawfly activity has been more commonly encountered in coastal Southeast Alaska. In 1971 and 1972 the alder sawfly heavily infested young alder stands near Juneau. During 1991 in Southeast Alaska, alder sawflies defoliated approximately 300 acres of alder along the Stikine River. Heavy defoliation presumably slows the growth rate of affected trees, but no impact data are available.

Figure 1. Black spruce on the Kenai Peninsula killed by spruce beetle. This rare occurrence is indicative of extremely high beetle populations.

Figure 2. Eastern spruce budworm defoliation of white spruce near Fairbanks.

Figure 3. Spruce needle rust on Sitka Spruce.

Figure 4. Decline and mortality of yellow-cedar now exceeds 500,000 acres in Southeast Alaska

## STATUS OF DISEASES

### HEMLOCK DWARF MISTLETOE
*Arceuthobium tsugense* (Rosendhal) G.N. Jones

Hemlock dwarf mistletoe is common in unmanaged, old-growth stands throughout southeast Alaska as far north as Haines. Within the range of western hemlock, dwarf mistletoe is absent from Cross Sound to the northwest along the Gulf of Alaska; thus, managers need not be concerned about the disease in these areas.

In southeast Alaska, old-growth hemlock stands vary in their level of infestation from stands in which almost every hemlock is infected to other stands in which the parasite is absent. Most old-growth stands at lower elevation have some level of infestation. Sitka spruce and mountain hemlock are only rarely infected. Heavily infected western hemlock trees have branch proliferations (witches-brooms), bole deformities, reduced radial growth, or may die--all potential problems in stands managed for wood production. The disease affects stand structure in unmanaged stands by causing mortality or by slowing growth of infected trees. When mixed-species stands are heavily infected, growth of resistant species such as Sitka spruce and the cedars may be enhanced. Witches-brooms may provide hiding or nesting habitat for birds or small mammals.

The principle forms of introduction of the parasite into young-growth stands are 1) infected non-merchantable hemlock trees (residuals) which are sometimes left standing in cut-over areas, 2) infected old-growth hemlocks on the perimeters of cut-over areas, and 3) infected advanced reproduction. Residuals may play the biggest role in the initial spread to young stands. Managers who use new techniques of forest management (New Perspectives, New Forestry) where large residuals are left standing in clearcuts or where harvest units are very small should consider the probable increased impact of dwarf mistletoe in hemlock regeneration.

A demonstration area near Thorne Bay on Prince of Wales Island, Alaska was developed to provide information on the recognition, biology, impact, and recommended silvicultural techniques for managing hemlock dwarf mistletoe in young-growth stands. Killing infected residual hemlocks (by girdling or felling) and discrimination against advanced reproduction during precommercial thinning can help reduce initial spread to young stands. Care in laying out cutting boundaries to avoid infected old-growth hemlock on clearcut perimeters is also highly recommended. Recent extensive surveys in young-growth stands up to rotation age in southeast Alaska indicate that the disease occurs at low frequency and low impact as long as residual trees are not present. Current studies are examining the incidence and impact of hemlock dwarf mistletoe in young-growth stands with large infected residuals present.

### HEMLOCK CANKER
*Xenomeris abietis* Barr.

An outbreak of hemlock canker continued to develop from last year's onset on Prince of Wales Island. Small hemlocks and the lower crowns of large hemlock trees were killed along more than 60 miles of road.

The disease has been inconspicuous since 1985, the year of its last outbreak. In the 1985 outbreak, the disease was confined to old-growth stands along about 30 miles of roads on Prince of Wales Island. This year, the disease had a similar, although larger distribution and was again confined within about 100 ft of roads. However, in the current outbreak the disease was present in both old-growth and young-growth stands. As it killed more hemlock in managed young-growth stands, the disease became more of a management problem.

The causal agent is the fungus *Xenomeris abietis*, but it appears to be unable to damage trees far from roads. Apparently, road dust is necessary for the fungus to invade hemlock tissues successfully. The previous outbreak of the disease began before 1985 and before some roads were paved on Prince of Wales Island. None of the hemlock canker found this year was along paved roads, even though the disease was conspicuous in these locations during the previous outbreak. Thus, road dust may contribute to development of the disease.

## SPRUCE NEEDLE CAST
***Lirula macrospora*** (Hartig) Darker

*L. macrospora* causes the most important needle disease of Sitka spruce in coastal Alaska. The disease occurred at average infection levels in 1991. It was common on young Sitka spruce and the lower crowns of larger trees throughout coastal Alaska. The disease was especially visible in cutover areas and in urban areas. The life cycle of the fungus has recently been elucidated. The only needles infected are those that have recently emerged from buds in spring. Needles do not develop any symptoms until one year after infection, and the fungus does not produce infectious spores until needles have been infected for two years. The timing of sporulation coincides with bud break in the spring and ceases at about the time of full shoot elongation. Using this information, a study recently demonstrated that fungicides applied soon after spruce bud break successfully controls the disease.

## SIROCOCCUS SHOOT BLIGHT
***Sirococcus strobilinus*** Pruess.

Sirococcus shoot blight kills shoots and tops of western hemlock in young-growth stands in southeast Alaska. Sitka spruce is sometimes also attacked. The incidence of the disease was moderate in 1991. Young hemlocks in thinned stands have fewer infections than in nonthinned stands.

## SHOOT BLIGHT OF YELLOW-CEDAR
***Apostrasseria sp.***

Shoot blight, caused by the fungus *Apostrasseria* sp., was abundant on regenerating yellow-cedar (*Chamaecyparis nootkatensis*) in southeast Alaska this year. The disease does not affect mature cedar trees. The incidence of shoot blight has not changed appreciably over the past several years. Attack by the fungus causes terminal and lateral shoots to be killed back 10 cm or so on seedlings and saplings during winter or early spring. Young seedlings are sometimes killed. The newly discovered fungus that causes the disease, *Apostrasseria* sp., is closely related to other fungi that cause disease to plants under snow. A recent study at Anita Bay on Etolin Island indicates that

yellow-cedar seedlings planted near naturally regenerating yellow-cedar are more likely to become infected with *Apostrasseria* than seedlings planted well away from natural cedar regeneration. Inoculum source of the fungus probably explains this different level of infection.

## SPRUCE NEEDLE RUST
***Chrysomyxa ledicola*** Lagerh.

Spruce needle rust was abundant this year on Sitka spruce in Southeast Alaska and all species of spruce on the Kenai Peninsula and in Southwest Alaska (see Figure 3). Infection levels were particularly heavy in Juneau and Dillingham. The spores that infect spruce needles are produced on the alternate host, Labrador-tea (*Ledum* spp.), a plant that is common in boggy, poorly drained areas; thus the disease on spruce is most pronounced in these boggy (muskeg) areas. Although the disease can give spruce trees the appearance of being nearly dead, trees rarely, if ever, die from this disease even in years of intense infection.

## SPRUCE BROOM RUST
***Chrysomyxa arctostaphyli*** Diet.

Spruce broom rust causes perennial infections that result in dense clusters of branches on white, Lutz, Sitka, and black spruce. The incidence of the disease changes little from year to year. It is common wherever spruce grows near the alternate host, bearberry or kinnikinnik (*Arctostaphylus uva-ursi*) in Alaska. The disease is common in interior and south-central Alaska, where scattered individual trees are infected, but only occurs in localized areas of Southeast Alaska where the alternate host is common (e.g., Halleck Harbor area of Kuiu Island and Glacier Bay). The disease may cause slow growth on spruce, although this has not been determined by research. The dense clusters of branches and needles (brooms) are known to provide nesting and hiding habitat for many birds and perhaps for small mammals.

## HEMLOCK NEEDLE RUST
***Pucciniastrum vaccinii*** (Rab.) Joerst.

Hemlock needle rust occurred at low, endemic levels on needles of western hemlock this year. The alternate hosts for this rust fungus are blueberries (*Vaccinium alaskensis* and *V. ovalafolium*), which are very common understory plants in hemlock-spruce forests.

## WESTERN GALL RUST
***Endocronartium harknessii*** (J.P. Moore) Hirat.

The rust fungus *E. harknessii* continued to cause spherical galls on branches and main boles of shore pine. The disease was common throughout the distribution of pine in Alaska. Typically, the rust fungus does not kill pine tissues. Another fungus, *Nectria macrospora*, colonized and killed many of the pine branches with these galls this year. In cases where galls were located on the main bole, *N. macrospora* commonly caused top-kill.

## FOLIAGE DISEASES OF CEDARS
***Gymnosporangium nootkatense*** Arth. and ***Didymascella thujina*** (Durand) Maire

Two fungi that occur on the foliage of cedar, *Gymnosporangium* on

Alaska-yellow cedar and *Didymascella* on western redcedar, occurred at low, endemic levels this year. They neither severely defoliated nor killed cedar trees.

## VENTURIA LEAF BLIGHT
*Venturia populina* Frabic.

Quaking aspen on the Kenai Peninsula, especialy around the Mile 35 area of the Seward Highway north of Moose Pass, were heavily impacted with leaf blight. Leaf blight causes infections on leaf tips which result in leaf distortion and discoloration. Normally the leaf bases remain alive. However, leaf beetle (Chrysomela sp.) populations were also feeding on infected leaves thus increasing the defoliation levels. However, overall impact on aspen health should be low with very little long term consequences. At worse, some limited branch dieback and growth reduction may have occurred. Control of leaf blight on ornamentals is by prunning blighted twigs; however, no practical control exists in forested stands.

## YELLOW-CEDAR DECLINE

Yellow-cedar decline persists as one of the most spectacular and important forest diseases in Southeast Alaska (Figure 4). About 526,000 acres of decline have been mapped during aerial detection surveys. Concentrated mortality occurs in a wide band from western Chichagof and Baranof Islands to the Ketchikan Area. Ground surveys indicate that 65% of the basal area of Alaska yellow-cedar is dead on this acreage. Other tree species are relatively unaffected.

Cedar trees have probably died throughout southeast Alaska every year since the onset of the problem about 100 years ago. This year, as in the previous several years, dying discolored trees were particularly common in areas around south Wrangell Island and of Slocum Arm on Chichagof Island.

All research suggests that no contagious organism is the primary cause for this intensive and extensive mortality. Some abiotic (non-living) site factor, probably associated with the poorly-drained anaerobic soils where decline occurs, appears to be responsible for initiating and continuing cedar decline.

A detailed list of acreage affected by Alaska-yellow cedar decline has been determined from a composite map developed by mapping dead and dying cedar during annual aerial detection surveys conducted over the previous 22 years (Appendix A). Recent research suggests that the total acreage of cedar decline has been increasing very slowly; the slow increase in area of cedar decline is a result of the expansion of existing decline-affected areas (less than 1 m per year) of decline to adjacent stands. Contained within most declining stands are trees that died up to 100 years ago (snags still standing), more recently killed cedars, dying cedars (with yellow, red, or thinning crowns), healthy cedars, and other tree species.

## HEMLOCK FLUTING

Fluting on the boles of western hemlock is common throughout southeast Alaska. Hemlocks with fluting have deeply incised grooves and ridges extending vertically along their boles; a condition that reduces

the value of hemlock logs because they yield less sawlog volume and bark is contained in some of the wood. The cause of fluting is not completely known, but associated factors include increased wind-firmness of fluted trees, common occurrence on sites with shallow soils, triggering of fluting by growth release, and fluting on boles corresponding with patterns of translocation. Researchers have recently documented the presence of fluting in young hemlock stands.

## DECAYS

**Conifers.** Decay fungi (including heart rot, sap rot, and butt rot fungi) cause substantial loss of wood volume in Alaskan forests. A comprehensive list of wood decay fungi found in Alaska would be quite extensive. Appendix B lists the more common species, and indicates, for each species, its known conifer hosts, type of decay, and mode of attack.

Decay problems are particularly serious in southeast Alaska where long-lived tree species predominate in old-growth forests, and the slow-growing decay fungi have ample time to cause significant losses. Decay fungi play an important role in the structure and function of coastal old-growth forests where fire and other forms of catastrophic disturbance are uncommon. By predisposing large old trees to bole breakage, these fungi serve as important disturbing factors that cause small scale canopy gaps.

The importance of decay fungi in managed young-growth conifer stands is less certain. Wounds to live trees caused by logging activities may allow decay fungi to cause appreciable losses. Studies in progress are investigating how frequently fungi enter wounds of different sizes and the rate of subsequent decay in these wounded trees.

In southeast Alaska, the following fungi are the most important causes of wood decay in live trees:

Sitka spruce
- *Fomitopsis pinicola*
- *Phellinus pini*
- *Armillaria* sp.
- *Phaeolus schweinitzii*
- *Laetiporus sulphureus*

Western hemlock
- *Fomitopsis pinicola*
- *Armillaria sp.*
- *Heterobasidion annosum*
- *Laetiporus sulphureus*
- *Phaeolus schweinitzii*
- *Phellinus robustus*
- *Phellinus pini*

Western redcedar
- *Poria albipellucida*
- *Phellinus weirii*

With the exception of *Armillaria* sp., all decay fungi important on Sitka spruce are also important in decay of white spruce in south-central and interior Alaska (and on Lutz spruce on the Kenai Peninsula). In addition, significant volume loss occurs in white and Lutz spruce from butt rot caused by *Coniophora puteana*, and recent studies indicate that *Pholiota alnicola* is an important cause of butt rot in Lutz spruce on the Kenai Peninsula.

Saprot fungi typically decay dead branches and large woody debris and therefore play an essential role in recycling wood in nondisturbed forests. However, saprot

decay also routinely becomes established in spruce trees attacked by spruce bark beetles. Large volumes of potentially recoverable timber volume are currently being lost annually on the Kenai Peninsula, where salvage logging has not kept pace with tree mortality from the continuing spruce beetle outbreak. Significant volume loss from saprot appears to begin about 4-5 years following tree death. Several species of saprot fungi (Appendix B) are associated with spruce beetle-caused mortality, but *Fomitopsis pinicola* occurs most commonly.

At population levels typical in an outbreak, spruce beetles show little or no preference for trees weakened by disease. Attacks are frequently successful even when trees are relatively healthy because beetles attacking individual trees in mass are able to overcome host defenses. Recent studies on the Kenai Peninsula have examined the relation between spruce beetle activity and root disease occurrence when spruce beetle populations are at endemic (low) levels. Results indicate that trees with moderate to severe root decay are preferentially attacked by beetles when a local beetle population is still relatively small. Diseased trees were often observed to be attacked lightly by beetles for a few, to several, consecutive years before succumbing to beetle attack. Once successfully attacked, diseased trees served as focal points for new attacks on neighboring trees. Root disease conditions in a stand may therefore have a significant influence on the population dynamics of endemic spruce beetle populations.

**Hardwoods.** Heart rots are the most important cause of volume loss in Alaskan hardwood species. Incidence of heartrot in hardwood species of interior and south-central Alaska is generally high by the time a stand has reached maturity (about 50 years old). Substantial volume loss can be expected in stands 80 years old or older. Detailed data on volume losses by stand age class and forest type are currently lacking; large scale studies are needed to better characterize these relationships.

*Pleurotus* sp. and *Pholiota* sp., which produce annual sporophores, commonly occur on trembling aspen, black cottonwood, and paper birch, but are not as common as heartrot fungi that form perennial sporophores on these tree species. *Phellinus igniarius* (L. ex Fr.) Quel. and *Fomes fomentarius* (Fr.) Kichx. account for the majority of decay in paper birch, with the former stem decay fungus being the most important in terms of both incidence and decay volume. *Phellinus tremulae* (Bord.) Bond & Boriss. accounts for the majority of stem decay in both trembling aspen and black cottonwood.

## STATUS OF ANIMAL DAMAGE

### PORCUPINE
***Erethizon dorsatum***

Porcupines continued to cause damage to tree species in southeast Alaska. This year, an extensive survey continued to document levels of porcupine damage in young-growth stands in southeast Alaska. Thus far, damage is confined to the known distribution of porcupine and is most common on Sitka spruce and western hemlock. Damage is especially serious on Mitkof Island in southeast Alaska. Other damage has been noted at Thomas Bay, Cleveland Peninsula, Bradfield Canal, Anita Bay, Douglas Island, the Juneau

area, and the Haines area. Shore pine near Haines received notable damage the last few years.

Survey results indicate that the feeding behavior of porcupines changes as stands age and trees become larger and older. Porcupines climb smaller trees and kill or cause topkill by removing bark along the entire bole, or the bole near the top of the tree. As trees become larger, somewhere around 40-50 years old, porcupines climb fewer trees and most of the damage is caused by basal wounding. Most of these larger trees are not killed, but the large basal scars allow fungi to enter the bole and begin to cause wood decay.

**BROWN BEAR**
***Ursus arctos***

The lower boles of Alaska-yellow cedar trees were wounded in spring on Baranof and Chichagof Islands, particularly in the Peril Strait and Slocum Arm areas. Other tree species were unaffected. Trees with old scars have associated columns of wood decay that will limit the value of their butt logs.

## INTEGRATED PEST MANAGEMENT ACTIVITIES

Integrated pest management has been described as a "systems approach to reducing pest damage to feasible levels through a variety of techniques, including predators and parasites, genetically resistant hosts, natural environmental modifications, and when necessary and appropriate, chemical pesticides." Current FPM activities in Region 10 include:

(1) Participation in a cooperative effort with Alaska Agricultural Research Station and the Cooperative Extension Service to provide pest management information to Alaska residents. The program, which includes education, research and survey activities, provides integrated pest management information concerning urban forestry and garden and greenhouse pests. This program includes an IPM Newsletter that is published monthly throughout the summer. There were eight pest scouts (6 full-time, 2 part-time) in seven communities in Alaska: Fairbanks, Delta Junction, Palmer, Anchorage, Soldotna, Juneau, and Kodiak. In 1991, pest scouts made over 3,000 contacts including 400 site visits.

(2) An aerial and ground application of methylcyclohexenone (MCH) for the prevention of spruce beetle attacks and population build-up in downed material was undertaken in the spring of 1991. MCH is the naturally occurring anti-aggregating pheromone of the spruce beetle. That is, it functions as a repellent. The project was undertaken on a recently constructed gas-line right-of-way (ROW) between Beluga and Tyonek on the west side of Cook Inlet. The objective of the study was to test the effectiveness of various dosages and application techniques of a formulated slow release pellet of MCH in reducing or eliminating spruce bark beetle build-up in downed ROW debris. There were no significant differences between aerial treatments and untreated check plots. Lack of significance was attributed to poor distribution of pellets. The ground application, with its greater control over deployment and final location of pellets, resulted in a reduction in the number of spruce beetle attacks and subsequent

population build-up. Follow-up studies are planned for 1992.

(3) A study was undertaken last summer to evaluate the effectiveness of covering spruce beetle infested logs with visqueen in order to sufficiently raise the sub-cortical temperatures of the logs to kill developing spruce beetle brood. Fifteen infested bolts were each covered with black and clear visqueen. An additional 15 infested bolts were left untreated as a check. Thermistors were used to record ambient and sub-cortical temperatures of the treated and untreated check logs. Post-treatment sampling indicated no significant increases in mortality due to the visqueen treatments. Apparently, summer temperatures in South-Central Alaska are not warm enough to raise visqueen covered log temperatures sufficiently high enough to kill developing spruce beetle brood.

4) A U.S. Forest Service, Forest Pest Management, sponsored survey of residents and visitors to the Kenai Peninsula, Alaska, revealed several consistent patterns of perceptual and attitudinal responses to the on-going spruce bark beetle outbreak in the area. Residents and visitors consistently rated bark beetle damaged forest vistas lower in scenic beauty, and the more tree mortality present the lower the perceived scenic beauty.

Results indicated that the majority of residents and visitors in the designated study area noticed the dead trees, and most were aware that the spruce bark beetle was the killing agent. Residents cited increased fire danger, loss of scenic beauty, and loss of wildlife habitat as the most important effects of the spruce bark beetle damage. Decreased attractiveness to tourists, loss of timber values, and decreased property values were judged as less important effects. The Alaska state survey confirmed the high levels of awareness and concern about the spruce bark beetle outbreak, with over 70% volunteering that bark beetle damage is the major problem affecting Kenai Peninsula forests. Residents cited less attractive views, increased fire threat, and loss of privacy as the most important effects of the beetle outbreak.

The Forest Service sponsored survey sought to determine the cicumstances under which respondents would agree with the policy of "letting nature take its course" in the bark beetle outbreak. There was strong agreement with this policy for areas "far" from developed areas when damage was expected to be "less severe", but disagreement with the policy for areas "near" developments when damage was expected to be "more severe". Similarly, the state survey showed strongest support (49%) for leaving damaged forest areas "as is" in the backcountry, while there was slightly less support (42%) for cutting, burning, and replanting backcountry areas. This is in contrast to greater than a 60/40 split favoring treatment along hihways and nearly 80% favoring treatment near homes.

Several conclusions are indicated by the Forest Service survey of public perceptions of the effects of the spruce bark beetle outbreak. These conclusions are also supported by the related survey conducted for the State of Alaska:

1. The substantial majority of residents and visitors notice the large numbers of dead trees in the Cooper Landing study

area, and most are aware that the spruce bark beetle is the cause of tree mortality.

2. Both residents and visitors cite loss of scenic values as an important effect of the beetle damage, and visitors consistently report siteseeing as a dominant activity, and indicate views (of mountains, forests, and coastlines) as a major factor affecting the quality of their visit to Alaska.

3. Scenic beauty perceptions and preferences for alternative forest condition scenarios consistently show that visitors and residents: a) indicate decreased scenic values as the number of dead trees in a scene increases, b) prefer treatments of damaged forest stands that accelerate recovery of forest cover, and c) prefer a preventative thinning scenario to a no-control scenario that results in substantial bark beetle-induced tree mortality.

4. Respondents expressed high agreement with a policy of allowing "nature to take its course" in backcountry areas where damage was indicated as "less severe", but expressed disagreement with this policy for areas near devlopments, especially when damage is "more severe".

In sum, the survey reveals that there is a high level of awareness of bark beetle effects on the forest and that these effects are consistently perceived as having negative consequences for important scenic values.

## SUBMITTING INSECTS AND DISEASES FOR IDENTIFICATION

The following procedures for the collection and shipment of specimens should be used for submitting samples to specialists:

I. Specimen collection:
   1. Adequate material should be collected
   2. Adequate information should be noted, including the following:
      a. Location of collection
      b. When collected
      c. Who collected the specimen
      d. Host description (species, age, condition, # of affected plants)
      e. Description of area (e.g., old or young forest, bog, urban);
      f. Unusual conditions (e.g., frost, poor soil drainage, misapplication of fertilizers or pesticides?).
   3. Personal opinion of the cause of the problem is very helpful

II. Shipment of specimens:
   1. General: Pack specimens in such a manner to protect against breakage.
   2. Insects: If sent through the mail, pack so that they withstand rough treatment.
      a. Larvae and other soft-bodied insects should be shipped in small screw-top vials or bottles containing at least 70% isopropyl (rubbing) alcohol. Make certain the bottles are sealed well. Include in each vial adequate information, or a code, relating the sample to the written description and information. Labels inserted in the vial should be written on with pencil or India ink. Do not use a ballpoint pen, as the ink is not permanent.
      b. Pupae and hard-bodied insects may be shipped either in alcohol or in small boxes. Specimens should be placed between layers of tissue paper in the shipping boxes. Pack carefully and make certain that there is very little movement of material within the box. Do not pack insects in cotton.
   3. Needle or foliage diseases: Do not ship in plastic bags. Sprinkle lightly with water before wrapping in newspaper. Pack carefully and make sure that there is very little movement of material within the box. Include the above collection information. For spruce and other conifers, include a description of whether current year's-needles, last-year's needles, or old-needles are attacked.
   4. Mushrooms and conks (bracket fungi): Do not ship in plastic bags. Either pack and ship immediately, or first air dry and then pack. To pack, wrap specimens in dry newspaper and pack into a shipping box with more newspaper. If on wood, include some of the decayed wood. Be sure to include all collection information.

III. Shipping:
   1. Ship as quickly as possible, especially if specimens are fresh and not air-dried. If samples cannot be shipped rapidly, then store in a refrigerator.
   2. Include address inside shipping box.
   3. Mark on outside: "Fragile: Insect-disease specimens enclosed; For scientific purposes only; No commercial value."

## FOREST INSECT AND DISEASE BIOLOGICAL EVALUATIONS, TECHNICAL REPORTS, AND MISCELLANEOUS PUBLICATIONS


Daniel, T.C. and B. Orland. 1991. Public Perception Regarding Spruce Bark Beetle Damage to Forest Resources on the Chugach National Forest, An Interim Summary Report. USDA For. Serv., FPM, Alaska Region. 5 pp.

Hennon, P.E. 1990. Etiologies of forest declines in western North America. Proceedings of Society of American Foresters. Washington, D.C. July 29-August 1, 1990. Pp. 154-159.

Hennon, P.E. 1991. Survival, growth, and shoot blight of planted Alaska yellow-cedar seedlings on Etolin Island, Alaska. USDA Forest Service, State and Private Forestry, Juneau, AK. Forest Pest Management, Gen. Tech. Rep. R10-TP-20. 14p.

Hennon, P.E.; Loopstra, E.M. 1991. Persistence of western hemlock and western redcedar trees 38 years after girdling on Cat Island in southeast Alaska. PNW Research Note. PNW-RN-507. 5p.

Shaw, C.G. III; Hennon, P.E. 1991. Intensification and upward spread of hemlock dwarf mistletoe in southeast Alaska. Plant Disease 75:363-367.

Hennon, P.E.; Shaw, C.G. III; Hansen, E.M. 1992. Cedar decline: distribution, etiology, and epidemiology. In: Forest declines, ed. P. Manion, American Phytopahtological Society Press, St. Paul, MN. In press.

Hennon, P.E.; Shaw, C.G. III; Hansen, E.M. 1992. Reproduction and forest decline of *Chamaecyparis nootkatensis* in southeast Alaska. Proceedings of V International Congress of Ecology, Aug. 23-30, 1991. Yokohama, Japan. In press.

Hennon, P.E. 1992. Diseases, insects, and animal damage of yellow cypress. Proceedings of Yellow cypress-can we grow it? Can we sell it? Mar. 26-28, 1991. Vancouver, B.C. In press.

Hennon, P.E. 1992. Another outbreak of hemlock canker along roads of Prince of Wales Island. USDA For. Ser., Alaska Region, Forest Pest Management. Juneau, AK. Biol. Evaluation. R10-91-8. In review.

Hennon, P.E. 1992. Current knowledge of ecology and silviculture of yellow-cedar in southeast Alaska: information exchange at Sitka Alaska, November 1991. USDA For. Ser., Forest Pest Management, Juneau, AK. Gen. Tech. Rep. R10 92 xx. In review.

Holsten, E.H., Thier, R.W., and J.M. Schmid. 1991. The Spruce Beetle, Forest Insect and Disease Leaflet 127, USDA For. Serv., 12pp.

Kruse, J. and R. Pelz. 1991. Research Summary: Managing Beetle-Killed Spruce on the Kenai Peninsula. Instit, of Soc. & Econ. Res. Univ. of Alaska, Anchorage. RS-51. 4pp.

Lessard, G. 1990. Seed and Cone Insect Assessment in the Cooper Landing Area, Kenai Peninsula, Alaska. FPM, State and Private Forestry, USDA For. Serv., Alaska Region, Bio Eval. R10-90-10. 3pp.

Lessard, G. and R. Wolfe. 1990. Hazard Tree Evaluation, Bird Creek Campground, Alaska Div. of Parks and Outdoor Recreation, FPM, State and Private Forestry, USDA For. Serv. Alaska Region, Bio. Eval. R10-90-4. 8pp.

Mask, R. 1991. Investigation of Spruce Beetle and Spruce Budworm Activity Near Haines, Alaska. FPM, State and Private Forestry. USDA For. Serv., Alaska Region, Bio. Eval. R10-90-7, 9pp.

Newton, M. and E.C. Cole. 1990 Vegetative Management in the Cooper Landing Area, Chugach National Forest. FPM, State and Private Forestry, USDA For. Serv. Alaska Region, Bio Eval. R10-90-5, 18pp.

Orland, B., Daniel, T.C., Lynch, A.M. and E. H. Holsten. 1992. Data-Driven Visual Simulation of Alternative Futures for Forested Landscapes. Proceedings-IUFRO-Integ. Forest Information Over Space and Time, Jan. 13-17. 12pp.

Werner, R.A. and E.H. Holsten. 1991. Effectiveness of Carbaryl With and Without Diesel for Remedial Control of Spruce Beetles (Coleoptera: Scolytidae) in Infested Spruce in Alaska. Journal of Economic Ent. (In Press).

USDA Forest Service. 1990. Forest Insect and Disease Conditions in Alaska-1990. Forest Pest Management, State and Private Forestry, USDA Forest Service, Alaska Region, Juneau, Alaksa. FPM Conditions Report. R10-90-C-1. 25pp.

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## MAILING LIST UPDATE AND REVISION

At this time, we wish to update our mailing list of all cooperators. Only those persons or agencies returning this form by June 15, 1992 will receive subsequent mailings of reports. Please complete this form and return to:

Forest Pest Management
USDA Forest Service
201 E. Ninth Ave., Suite 206
Anchorage, Alaska 99501

Your current address:

_____
_____
_____
_____

I would like to receive the following publications:
(please check one or more)

- O Entomology biological evaluations
- O Pathology biological evaluations
- O Technical reports - entomology
- O Technical reports - pathology
- O Forest Pest Management Annual Reports

# Appendix A

## ACREAGE AFFECTED BY ALASKA YELLOW-CEDAR IN SOUTHEAST ALASKA

## AS OF 1991

| | Acres |
|---|---|
| NATIONAL FOREST LAND | 500,406 |
| Chatham Area | 132,590 |
| Juneau Ranger District | 1,167 |
| Hoonah Ranger District | 2,179 |
| Sitka Ranger District | |
| Chichagof I | 36,897 |
| Baronof I | 58,564 |
| Kruzof I | 27,971 |
| Total | 123,432 |
| Admiralty Island Nat'l Mon. Wilderness | 5,812 |
| Stikine Area | 220,794 |
| Petersburg Ranger District | |
| Kupreanof I | 79,602 |
| Kuiu I | 66,030 |
| Mitkof I | 5,644 |
| Woewodski I | 2,258 |
| Mainland | 7,707 |
| Total | 161,241 |
| Wrangell Ranger District | |
| Etolin I | 22,341 |
| Wrangell I | 14,313 |
| Zarembo I | 9,496 |
| Woronofski I | 622 |
| Mainland | 12,781 |
| Total | 59,553 |
| Ketchikan Area | 147,022 |
| Thorne Bay Ranger District | |
| Prince of Wales I | 27,024 |
| Kosciusko I | 12,027 |
| Heceta I | 685 |
| Total | 39,736 |
| Ketchikan Area (continued) | |
| Craig Ranger District | |
| Prince of Wales I | 36,637 |
| Dall I. and Long I | 1,323 |
| Total | 37,960 |
| Ketchikan Ranger District | |
| Revillagigedo I | 19,382 |
| Gravina I | 3,200 |
| Mainland | 19,070 |
| Total | 41,652 |
| Misty Fjords Nat'l Mon. Wilderness | |
| Revillagigedo I | 11,599 |
| Mainland | 16,075 |
| Total | 27,674 |
| NATIVE LAND | 17,511 |
| Prince of Wales I | 10,196 |
| Kupreanof I | 312 |
| Sukkwan I | 156 |
| Ketchikan area | 5,058 |
| Annette I | 1,789 |
| STATE AND PRIVATE LAND | 8,718 |
| Sitka area | 1,246 |
| Mitkof I | 1,362 |
| Kupreanof I | 234 |
| Prince of Wales I | 632 |
| Wrangell area | 311 |
| Pelican area | 156 |
| Ketchikan area | 1,508 |
| Gravina I | 2958 |
| Koscusko I | 311 |
| **TOTAL LAND AFFECTED** | **526,567** |

Appendix B

DECAY FUNGI ASSOCIATED WITH SPRUCE AND HEMLOCK IN ALASKA.

| Species and authority | Hosts[a] | Type of decay[b] | Mode of attack[c] |
|---|---|---|---|
| Antrodia albobrunnea (Rommell) Ryvarden | WS | BC | S-HR |
| Antrodia carbonica (Overh.) Ryv. & Gilbn. | SS, WH | BC | S-HR |
| Antrodia crassa (Karst.) Ryvarden | WS | BR | S-HR,SR |
| Antrodia heteromorpha (Fr.) Donk | WS | BC | S-HR,SR |
| Antrodia serialis (Fr.) Donk | WS, SS | BC | S-HR |
| Antrodia xantha (Fr.) Ryv. | WS | BC | S-HR,SR |
| Armillaria ostoyae (Romagn.) Herink | WS, SS, WH, MH? | YS | P,S-R&B |
| Bjerkandera adusta (Willd.:Fr.) Karst. | WS | WR | P-SR |
| Botryobasidium vagum (Berk. & Curt.) Rogers | WS | WR | ? |
| Ceriporiopsis rivulosa (Berk. & Curt.) Gilbn. & Ryv. | WS, SS, WH | WSR | P-HR |
| Chondrostereum purpureum (Fr.) Pouz. | WS | WR | S-SR |
| Climacocystis borealis (Fr.) Kotl. & Pouz. | SS | WMR | P-HR |
| Coniophora puteana (Schum. ex Fr.) Karst. | WS, WH | BC | P,S-R&B,HR,SR |
| Crustoderma dryinum (Berk. & Curt. in Berk.) Parm. | WS | WR | P-SR? |
| Dichomitus squalens (Karst.) Reid | WS | WPR | P-HR |
| Diplomitoporus crustulinus (Bres.) Dom. | WS | WR | S-SR |
| Diplomitoporus lindbladii (Berk.) Gilbn. & Ryv. | WS | WR | S-HR,SR |
| Echinodontium tinctorium (Ell. & Ev.) Ell. & Ev. | MH, WH? | YS | HR |
| Fomitopsis officinalis (Vill.:Fr.) Bond. & Sing. | WS, SS, WH | BC | P,S-HR,SR |
| Fomitopsis pinicola (Swartz.:Fr.) Karst. | WS, SS, WH, MH | BC | P,S-HR,SR |
| Fomitopsis cajanderi | WS, WH | BC | P,S-HR |
| Ganoderma applanatum (Pers.:Wallr.) Pat. | WS, SS, WH | WSR | S-HR,SR |
| Ganoderma oregonense Murr. | SS, WH | WSR | S-HR,SR |
| Gloeophyllum odoratum (Wulf.:Fr.) Imazeki | WS | BR | S-HR,SR |
| Gloeophyllum saepiarium (Wulf.:Fr.) Karst. | WS | BR | S-HR,SR |
| Hericium abietis (Weir in Hubert) Harrington | SS, WH, MH | WPR | P-HR,SR |
| Heterobasidion annosum (Fr.) Bref. | SS, WH | WPR | P-R&B,HR |
| Inonotus tomentosus (Fr.) Gilb. | WS, SS, MH | WPR | P-R&B |
| Laetiporus sulphureus (Bull.:Fr.) Bond. & Sing. | WS, SS, WH | BC | P,S-R&B |
| Laurilia sulcata (Burt) Pouz. | WS | WR | P-R&B |
| Lentinus kauffmanii Smith | SS | BPR | P-R&B |
| Perenniporia subacida (Peck) Donk | WS | WSR | P-R&B |
| Phaeolus schweinitzii (Fr.) Pat. | WS, SS, WH | BC | P-R&B |
| Phanerochaete gigantea (Fr.:Fr.) Rattan | WS | WR | P-SR |

See footnotes at end of table.

Decay fungi associated with spruce and hemlock in Alaska (continued).

| Species and authority | Hosts[a] | Type of decay[b] | Mode of attack[c] |
|---|---|---|---|
| Phanerochaete laevis (Pers.:Fr.) Fr. | WS | WR | S-HR? |
| Phellinus pini (Thore ex Fr.) Pil. | WS, SS, WH, MH | WPR | P-HR |
| Phellinus punctatus (Fr.) Pilat | WH | WR | S-HR,SR |
| Phellinus robustus (Karst.) Bourd. & Galz. | WH, MH | WR | P-HR,SR |
| Phellinus viticola (Schw.:Fr.) Donk | WS | WR | S-HR,SR |
| Pholiota alnicola (Fr.) Sing. | WS | YS | P-R&B |
| Pholiota aurivella (Bat. ex Fr.) Kumm. | WS, SS, WH | BMR | P-HR |
| Postia (Oligoporia) balsamea (Peck) Julich | WS, SS, WH | BC | P-R&B,SR |
| Postia (Oligoporia) guttulata (Peck) Julich | WS | BC | P-R&B |
| Postia (Oligoporia) placenta (Fr.) M.J. Larsen & Lombard | SS, WH | BC | S-HR,SR |
| Postia (Oligoporia) sericeomollis (Rommell) Julich | WS, SS, WH | BC | P,S-HR |
| Pycnoporellus alboluteus (Ell. & Ev.) Kotl. & Pouz. | WS | BC | S-SR |
| Scytinostroma galactina (Fr.) Donk | WS, WH | YS | P-R&B |
| Stereum sanguinolentum (Alb. & Schw.:Fr.) Fr. | WS, SS, WH, MH | YS | P,S-HR,SR |
| Trametes versicolor Fr. | SS, WH | WSR | S-SR |
| Trichaptum abietinus (Dicks.:Fr.) Ryvarden | WS, SS, WH | WPR | S-SR |
| Veluticeps abietina (Pers.:Fr.) Hjort. & Telleria | SS, WH | BC | S-HR |

[a]Host species are: SS, Sitka spruce; WS, white spruce; MH, mountain hemlock; WH, western hemlock.

[b]Types of decay are: WR, white rot; YS, yellow stringy or yellow spongy rot; WMR, white mottled rot; WSR, white stringy or white spongy rot; WPR, white pocket rot; BR, brown rot; BC, brown cubical rot; BPR, brown pocket rot; BMR, brown mottled rot.

[b]Mode of attack is defined in a two-part code given as A-B. Before the hyphen, P and S are used to indicate primary and secondary attack, respectively. Primary attack means the decay typically occurs in living trees. After the hyphen, the codes R&B, HR, and SR are used to refer to root & butt rot, heart rot, and sap rot, respectively.

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